

# Memorial to William Christian Krumbein

## 1902–1979

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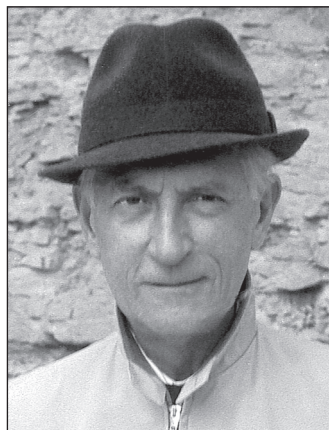
William Christian Krumbein, father of computer geology, pioneer in application of quantitative methods, especially statistical techniques to sediments and sedimentary rocks, and innovator of sediment analyses, was born in Beaver Falls, Pennsylvania, on 28 January 1902 and died of a heart attack in Los Angeles, California, on 18 August 1979. Bill was a true trailblazer in the study of sediments and sedimentary rocks—years ahead of his time—and as a consequence, he perhaps was not recognized fully in his lifetime for his innovations by his more conventional colleagues.

Bill's parents, Carl and Hattie, were immigrants from Germany, who had moved from Pennsylvania to the northwest side of Chicago, an area largely populated by Germans, when Bill and his older brother Henry J. were fairly young. Carl died soon after that, leaving Hattie to raise the boys. Bill attended Lane Technical High School and by 1920 was working in a hotel while his brother worked in a drugstore. Because he was a rather private person, little is known about Bill's parents and upbringing and less is known about his early childhood and family. Part of Bill's shyness may be the result of attitudes and incidents towards persons of German origin during WWI. An early marriage ended in failure, and in 1946 he married Marjorie Kamm, who had been a secretary to K.C. Heald, an associate of Bill's at Gulf Research and Development.

His degrees included a Ph.B. in business administration (1926) and election to Phi Beta Kappa, an M.S. in geology (1930), and a Ph.D. (1932) under the tutorage of J. Harlan Bretz, all from the University of Chicago. A D.Sc. (honora causa) from Syracuse University was awarded to him in 1979. His Master's thesis was entitled *A Key for the Determination of Minerals by Means of Structure, Form and Texture*; his doctoral dissertation was on *The Mechanical Analysis of Related Samples of Glacial Till*s. From this modest beginning, he developed his specialties in the study of the physical properties of sediments, application of statistics to sedimentology, the dynamics of sedimentary processes, and regional sedimentary analysis.

Early geological influences in Bill's life included Paul MacClintock at Chicago, who stimulated his interest in geology. His interest in sedimentary geology was piqued by Francis Pettijohn, a subject he recognized with a potential for the application of statistics. As a graduate student at Chicago, Bill shared an office with M. King Hubbert, who reinforced his belief that mathematics, physics, and chemistry were important to geologic studies.

After obtaining his Ph.D., he joined the faculty at the University of Chicago and advanced through the academic ranks from instructor to associate professor. During WWII, he worked in beach-landing intelligence for the Beach Erosion Board of the U.S. Corps of Engineers. After the war and a short stint with Gulf Research and Development Company (1945–46), Ed Dapples convinced him to move to Northwestern University as a full professor in 1946. He later was named



William Deering Professor of Geological Sciences at Northwestern and retired in 1970 as Distinguished Professor Emeritus. In 1955, he was on leave for research at the National Bureau of Standards in Washington, D.C. He moved to a better climate in California after his retirement, because of his emphysema, and taught part-time at UCLA.

He was known as a masterful teacher, totally devoted to his students. Larry Sloss described him as a teacher who used skill, patience, and humor to impart knowledge to his students (and his professional colleagues). Larry went on to say at Krumbein's memorial service at Northwestern that "...rejecting conventional wisdom, he continually pursued innovative methods whereby the natural phenomena of geology could be expressed with mathematical rigor."

His first papers in 1932 were on the mechanical analysis of fine-grained sediments and his last, fittingly enough, was in Syracuse University Geology Contribution 5 in 1978 on *Some Recent Developments in the Mathematical Geology of Stream-Channel Networks*. (He was senior author posthumously with Wolfgang Scherer and Dan Merriam on a paper, *CORSURF: A Covariance-Matrix Trend Analysis Program*, published in *Computers & Geosciences* in 1995.) In the intervening 56 years, he explored sampling, textures, size distribution, diagenesis, transport, properties, and classification of modern and ancient sediments. He was one of the early workers to extensively apply statistical techniques, which included descriptive statistics, Latin square experiments, regression analysis, Markov chains, and probabilistic modeling, to geological problems. He had an uncanny analytical mind and could cut through all the extraneous material directly to the problem. He consulted for various petroleum companies and much of his research was supported by grants from the Geography Branch of the Office of Naval Research and the Engineering Research Center of the U.S. Army Corps of Engineers.

With the introduction of the computer in the mid-1950s, he transferred his statistical analyses from the calculator to the computer. In 1958, he published (with L.L. Sloss) the first geologically oriented computer program (in SOAP) in a major geological journal. His last publications were philosophical in nature as he explored the directions and influences of quantification on sedimentology.

He carefully formulated and presented his ideas in his 130+ publications, including five books. In addition to his research papers, he contributed numerous papers to special theme volumes. A new approach to introductory geology was given in his book, *Down to Earth*, coauthored with Carey Croneis in 1935 and still was in print 40 years later. His manual with Francis Pettijohn, *Manual of Sedimentary Petrography* (1938), was a standard text for several decades, as was his book with Larry Sloss on *Stratigraphy and Sedimentation*, which went through two editions (1951, 1963). An *Atlas of Lithofacies Maps*, which was a compilation of student work, followed in 1960, authored by E.C. Dapples, Krumbein, and Sloss. However, it was his book in collaboration with Frank Graybill in 1965, *An Introduction to Statistical Models*, that put him far in the forefront of quantitative sedimentology (along with the other giant of the time, John C. Griffiths). Krumbein knew his limitations and always sought help with experts from other fields as needed and this was the situation with the statistical modeling book. As a result, he coauthored several papers with leading statisticians of the day, including John Tukey, Geoff Watson, Frank Graybill, Ron Shreve, and Mike Dacey.

He was a Fellow of the Geological Society of America (Councilor 1962–64; Associate Editor of *GSA Bulletin*, 1963–74), American Academy of Arts and Sciences, and the American Statistical Association; member of the SEPM (Society of Sedimentology) (President, 1950), Society of Exploration Geophysics, American Association of Petroleum Geologists (editor and member of the Executive Committee 1955–56), American Geophysical Union, and Illinois Academy of Science. He was a member of Sigma Xi and president of the Northwestern Chapter 1962–63. He served on many other professional and scientific organizations' committees and editorial boards.

Bill Krumbein was a charter member of the International Association for Mathematical Geology (IAMG). At the founding meeting at the 23rd International Geological Congress in Prague, he was elected the first Past-President of the Association (but served as one of two vice presidents). The IAMG premier award, the William Christian Krumbein Medal, was named in his honor and initiated in 1976 to recognize this outstanding geomathematician. When informed by President Merriam of the decision of the Council to create this award, in true modest Krumbein fashion, he replied "I am deeply moved by this generous action; so much so that I am at a loss for appropriate words to express my appreciation. The most I seem able to do is to thank you and the Council for honoring me in this enduring manner." These two tributes by the IAMG indicate the esteem held for him by his numerically-oriented peers.

SEPM honored him in 1977 by awarding him the prestigious Twenhofel Medal, the highest honor of the Society, for his contributions to the field of sedimentary geology—a well-deserved honor. He also received a Guggenheim Fellowship, was a Fulbright Lecturer, and a President's Fellow at Northwestern University. In 1945, he was given a commendation for Meritorious Civilian Service during WWII. In 1975, his friends, colleagues, and former students honored him with a festschrift, *William C. Krumbein, The Making of A Methodologist*, in recognition of "...his stimulating teaching and guidance...and continuing leadership and research..." which was published as a Memoir by the Geological Society of America.

Bill was preceded in death by his older brother, Henry. He was survived by his second wife, Marjorie, who died in Santa Monica, California, in 1989. There were no children from either marriage.

### Acknowledgments

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